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The impact of technology self-efficacy on stress perception and how the perception of stress influence job outcomes

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Abstract

The goal of this study is twofold. First the impact of technology self-efficacy on techno eustress and techno distress was measured. In addition, this study tries to determine the effects of both techno distress and techno eustress on job burnout and job engagement. The data was collected within a medium sized automation company. Partial least square structural equational modelling (PLS-SEM) was used for the data analysis. The results confirmed that techno distress had a negative effect on job burnout levels. Techno eustress lowered job burnout levels and increased job engagement. There was no significant measurable influence of technology self-efficacy on the variables techno distress or techno eustress.

Key terms

Technology self-efficacy, Techno eustress, Techno distress, Job burnout and Job engagement

Summary

Information technology (ICT) usage is increasingly important in current society. The rise of ICT is also present in organizations. ICT has a lot of benefits like increased productivity, cost reduction and efficiency. Organizations focus on the benefits of ICT. But the downsides of ICT usage are becoming increasingly clear. The usage of ICT leads to increased stress levels which in turn lead to negative job outcomes. Stress created by ICT usage is called technostress. The difficulty with technostress is that a certain amount of stress (eustress) can have a positive influence on an individual, while too much stress (distress) has a negative impact on individuals. Therefore, for organizations it is important to create an environment where stress levels positively influence employee performance and job outcomes. A possible factor that can help contribute to how stress is perceived is technology self-efficacy. Technology self-efficacy is the perception that an individual can accomplish technology related task.

Current research mainly focuses on techno distress and the negative job outcomes of techno distress. The goal of this study is twofold. First, the impact of technology self-efficacy on both techno distress and techno eustress is studied. It is expected that a higher level of technology self-efficacy leads to higher levels of techno eustress and lower levels of techno distress. Furthermore, the effects of techno distress and techno eustress on job outcomes is studied. In this study the job outcomes job burnout and job engagement are studied. Both constructs are used because these are opposite state of minds. It is expected that job distress leads to higher levels of job burnout and lower levels of job engagements, while techno eustress leads to lower levels of job burnout and higher levels of job engagement.

A survey was constructed to test the proposed model. This survey was sent to all employees of a medium-sized automation company. In total 236 respondents participated and finalized the survey. Based on the 236 responses statistical analysis was done through PLS-SEM analysis. The results could not confirm a significant relationship of technology self-efficacy on techno distress or techno eustress. Furthermore, techno distress did not have a significant effect on job engagement. The study confirmed that techno distress has a significant impact on increased job burnout levels. In addition, this research found that techno eustress led to lower levels of job burnout and a higher level of job engagement, although these effects were small.

For practical implications, the key finding of this study is that it is beneficial for employers to create a work environment where employees are exposed to limited amounts of stress. This has a positive effect on the job outcomes job burnout and job engagement. The key contribution for further research is that the understudied topic of techno eustress has a positive influence on job outcomes. Further research could improve understanding of techno eustress itself and the effect on job outcomes.

Contents

1. Introduction

The use of ICT in the workplace is essential if companies want to remain competitive in the market. As a consequence, 90% of the companies have increased the use of ICT in the workplace. The reason why the use of technology is steadily rising is because using technology has a lot of benefits. For example, investments in technology has had a crucial role in the growth of the economy of the G7 (Jorgenson, Stiroh, Gordon, & Sichel, 2000; Jorgenson & Vu, 2005). Other benefits are increased productivity, easier access to information and cost efficiency. But the use of technology has also created challenges. An important challenge is that the usage of technology can create stress for using the technology. There is a special term for this sort of stress, namely technostress. The term technostress was first defined in 1984 in the book called: "Technostressed: the human cost of the computer revolution" by Craig Brod (1984).

The concept of stress is not necessarily negative in itself. Stress can best be described as a double-edged phenomenon. How stress is perceived plays a key role in the outcomes of stress. It depends if stress is perceived as a threat or a challenge. If individuals perceive stress as a challenge it is called techno eustress. Techno eustress results in a higher satisfaction, job engagement and productivity (Wajcman & Rose, 2011). If stress in a technological environment is seen as a threat it is called techno distress. Techno distress has a negative impact on job satisfaction, productivity, burn-out and organizational commitment (Sarabadani, Carter, & Compeau, 2018).

For companies it is essential to create a work environment, which offer limited amounts of technostress. Because when stress turns to the negative spectrum it can have a devastating impact on the organization. TNO (2014) a Dutch research organization found for example that the total cost of work absenteeism in the Netherlands is 11,5 billion euro. It estimates that 2,7 billion euro of these costs can be addressed to work related stress. In addition, stress levels and burn-out amongst employees is still rising (Wennekers, 2018). As a consequence, it is beneficial for both companies and society to create an environment where stress can be seen as a challenge instead of a threat. This would result in lower absenteeism of employees and reduce healthcare costs among other benefits.

Therefore, it is important to look at what factors can influence stress and how it is perceived. The differences how stress is perceived can be explained both by organization characteristics and characteristics of the individual. The problem with organizational characteristics is that these characteristics cannot explain differences in perceived stress on an individual level.

On an individual level self-efficacy is seen as an important factor that influences perceived stress in the workplace (Betz & Hackett, 1981). With the rise of technology in society stress research has addressed the impact of technostress as a separate entity. In self-efficacy there has also been a narrower approach. Therefore, the term technology self-efficacy was introduced. Technology self-efficacy is the perception of the individual that they can accomplish technology related task (Tarafdar, Pullins, & Ragu-Nathan, 2015).

Research into the effect of technology self-efficacy is limited and focused on technostress as a negative construct. This means that it only focused on techno distress. The results have

shown that individuals with a higher level of technology self-efficacy will result in lower level of techno distress (Shu, Tu, & Wang, 2011; Tarafdar et al., 2015). But as stated earlier, stress can both be perceived as a negative and a positive construct (Tarafdar, Cooper, & Stich, 2019). Therefore, it is important to study the effect of technology self-efficacy on the whole concept of technostress. This means that both techno eustress and techno distress should be considered.

As a consequence, this research will focus on a deeper understanding of the relationship between technology self-efficacy and the whole concept of technostress. Therefore, this research will focus on the influence of technology self-efficacy on techno eustress and techno distress in individuals.

Most research into technostress only focuses on techno eustress or techno distress as isolated constructs. This includes research into the job outcomes of technostress. As discussed, technostress is a double-edged phenomenon. How stress is perceived can have a crucial impact on possible job outcomes. Based on previous research it would be expected that techno distress leads to negative job outcomes. While techno eustress should lead to beneficial job outcomes for individuals. Therefore, both a positive and a negative job outcome of technostress is implemented in this research.

Job hopping is a contemporary issue that employers need to deal with. Burn-outs and lower job engagement are important outcomes of technostress which increases the change of employees to switch jobs. Therefore, both burn-out and job engagement are included job outcomes in this research. This results in the following question:

Does technology self-efficacy influence both techno distress and techno eustress? And do techno distress and techno eustress influence burn-out and job engagement among employees?

The following approach is used to answer the research question. First, a literature review will discuss the current body of knowledge of the transactional model of stress, techno distress, techno eustress, technology self-efficacy, job burnout and job engagement. Next, the conceptual model and research hypotheses will be presented. The following chapter will present the chosen methodology which was used to conduct this study. The fifth chapter will present the results from this paper. The final chapter will discuss the results, a conclusion and ends with providing recommendations for practice and further research.

2 Literature review

This section starts with a description of the approach that was used to conduct the literature review. Following the research approach the transactional model of stress and technostress are discussed. In the next step the literature of technology self-efficacy is evaluated. The chapter concludes with a description of the job outcomes job burn-out and engagement.

2.1 Research approach

The literature review has been conducted in several steps. The approach is based on the article of Levy and Ellis (2006). In the article three different approaches are offered to conduct an effective literature review. The three available methods are 1. Keyword search, 2. Backward search and 3. Forward search. All options will be discussed.

For Keyword searching a university database is used to search on specific word(s) or string to find literature about the topic. It is a useful method to start with searching for literature on a certain topic. But this method has limitations. For example, this method will not yield all available literature of the subject. Furthermore, searching could be done on “buzzwords”, which could result in missing valuable information which uses other synonyms (Levy & Ellis, 2006).

Backward search is another available strategy used for searching the literature. This method is used to expand on the findings of the keyword search. There are three different backward search options. Backward reference search will focus on the references found in the articles from the keyword search. Backward authors search is used to find earlier research of the authors found in the keyword search. Previously used keywords is the last method in which keyword used by other authors are used as search strings in university (Levy & Ellis, 2006).

Forward search is focused on research which looks for articles which are published after the articles found in the keyword search. There are two different forward search options. In forward references search it is important to check where the article found in the keyword search has been cited. While forward authors search is used to find articles of the authors after the original research has been released (Levy & Ellis, 2006).

Based on the three available methods a literature search plan has been devised. For the literature review it is important which method(s) are used for finding the literature and which source were used. The most important source used for the literature review is Summon. Summon is the literature search engine of the Open Universiteit. Because the Open Universiteit does not have a subscription to all science journals also Google scholar is used to check if articles unavailable in Summon could be found using Google scholar.

For the first step Summon was used to do a keyword string search. In appendix A the findings of the keyword string search are shown. If the titles found in the keyword string search seemed relevant the abstract was read. If it seemed that the article could contribute the whole article was reviewed. Furthermore, based on the findings of Summon additional backward and forward search was used. The backward reference search was done in case it met one of the following criteria; 1. The reference could broaden understanding about the

development of knowledge of a certain topic, 2. It was a reference to the original theory, measurement scale or research model, 3. It seemed that the author was a subject matter expert. For example, the articles of the author Tarafdar were further studied, because the first and third criteria were met. As a consequence, both backward and forward search was used to find articles of the author Tarafdar. The backward and forward search in combination with the keyword string search resulted in the list of literature references.

2.2 Transactional model of stress and coping

The concept of technostress was first introduced by Brod (1984). Brod (1984, p. 16) defined the concept of technostress as; "Technostress is a modern disease of adaption caused by an inability to cope with the new computer technologies in a healthy manner". Since, the definition of technostress has changed significantly. An important step was to draw from the transactional model of stress for technostress conceptualization in the information system literature.

The transactional model of stress was developed by Lazarus in 1966 and later extended in combination with Folkman, Schaefer & Lazarus in 1979. The transactional model of stress consists of four components, namely; stressors, situational factors, strain and organizational outcomes. In the transactional model stress is seen as a cognitive state experienced by an individual when the environmental demands exceed the abilities of the individual, which leads to adverse consequences (McGrath, 1976). The imbalance between the environmental demands and individual abilities will result in stress.

Ragu-Nathan, Tarafdar, Ragu-Nathan, and Tu (2008) were the first to incorporate the transactional model of stress in technostress literature. In the transactional model stress is seen as a continues process between the individual and the environment. This model consists of four aspects, namely: 1. In the environment a situation occurs, 2. The situation is appraised by the individual 3. This activates coping responses 4. And ends with psychological, behavioral and physiological effects for the individual (Tarafdar et al., 2019). Stress occurs for individuals when the environmental demands exceed the capabilities of the individual. See figure 1 for the conceptualization of the transactional model of stress.

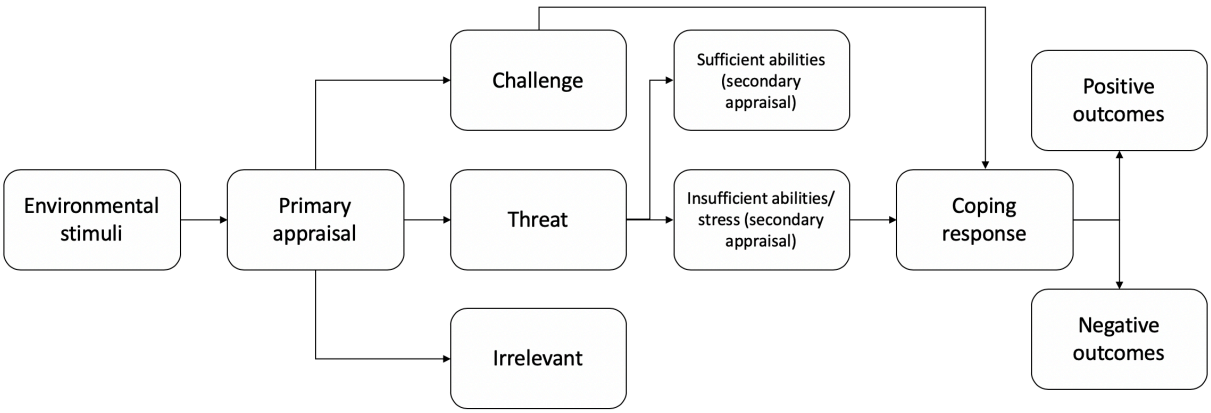

Figure 1 transactional model of stress

The differences in how stress is perceived is a result of how the individual appraises the environment. According to Folkman and Lazarus (1984) the appraisal process consists of a primary and secondary appraisal. In the primary appraisal an individual evaluates if the encounter is negative or positive for now and in the future. The secondary appraisal evaluates if something can be done to change the situation.

There are three types of primary stress appraisals, namely; 1. Harm/ loss, 2. Threat and 3. Challenge (Folkman & Lazarus, 1984). Harm/ loss focuses on damage which is already sustained. Threat and challenge appraisal are both anticipated appraisals, which can help with anticipatory coping before the situation takes place.

In the literature stress as a threat is described as distress while stress as a challenge is described as eustress. Threat is seen as a future harm/ loss, while challenge focuses more on potential growth or gain from the encounter. As a consequence, distress result in negative emotions and eustress result in positive emotions for the encounter.

2.2.1 Technostress

In this transactional model *stressors* can be distinguished as the factors that create stress. For technostress these factors are related to the use of IT. Ragu-Nathan et al. (2008) stated that there are five dimensions of technostress creators, namely: 1. Techno-overload, 2. Techno-invasion, techno-complexity, techno-insecurity, techno-uncertainty and. Techno-overload refers to working longer and faster. Techno-invasion describes the invasion in privacy, because people are always connected. Techno-complexity describes situations where the complexity of IT is above the skills of a person. Techno-insecurity describes the situation that people may lose their job because of advancement in IT. Techno-uncertainty describes the situation that IT continuously changes and has a lot of upkeep which means that people should keep their knowledge up-to-date.

The techno stressors result in strain for the user of IT. Strain can be seen as the psychological, behavioral and physical outcomes of the stressors. The literature shows that there several major outcomes of strain. Important outcomes of strain are 1. Job satisfaction, 2. Performance, 3. Productivity, 4. Organizational commitment and continuance commitment, 5. Job engagement and 6. Burn-out (Sarabadani et al., 2018; Ventura, Salanova, & Llorens, 2015). The effect of the stressors on the strain is dependent on how the stress is appraised by an individual.

As discussed earlier some people perceive stress as a challenge, while others view stress as a threat. Depending on the outcome of the appraisal stress can have beneficial outcomes or negative/ damaging consequences (Lazarus, 1966). Individuals who view the situation as a challenge see it as a learning opportunity, which can lead to growth and achievement. For those individuals stress has a positive influence on performance, productivity and job engagement (Ventura et al., 2015; Wajcman & Rose, 2011). If individuals perceive technostress as a threat the outcomes are the other way around. Technostress leads to lower job satisfaction, performance, productivity organizational commitment and burn-out (Ragu-Nathan et al., 2008; Sarabadani et al., 2018; Tarafdar et al., 2019; Ventura et al., 2015).

The differences in stress appraisal can be explained both by individual and/ or group characteristics. Looking at individual differences, Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan (2011) found that both age, gender and education can influence technostress. While organizations can reduce technostress by implementing technical support and creating IT involvement.

2.3 Technology self-efficacy

Behavior is situational dependent and changes per individual. This is because every individual perceives a situation differently. Therefore, the same set of stimuli can result in different emotional responses to those stimuli. It can even change for an individual if it is shown the same set of stimuli at a different time (Jones, 1989).

An important determinant that could explain these differences is self-efficacy. The concept of self-efficacy is coming from social cognitive theory (Bandura, 1982). It is a theoretical framework which is used for analyzing the motivation thought and action of humans. It is an interactive model in which behavior, cognition, other personal factors and environmental factors all interact with each other. All links between the determinants are bidirectional and can influence each other (Bandura, 1986)

In the literature self-efficacy is explained as: "the belief that one has the capability to perform a particular behavior" (Compeau & Higgins, 1995, p. 189). Earlier research has shown that the perception of self-efficacy influences both decision making about what behaviors to exert and shapes the emotional response of the individuals towards a certain task (Bandura, 1982).

The concept of self-efficacy is also studied in the technology domain. In the case of technology self-efficacy, it is the perception of the individual if they can accomplish technology related task (Tarafdar et al., 2015). In other research it is also called computer self-efficacy (Compeau & Higgins, 1995). In this thesis the term technology self-efficacy will be used. The reason is that computer related self-efficacy is does not consider the usage of smart phones and tablets, which in current society are frequently used both professionally and private.

Technology self-efficacy has impact on how individuals interact with technology. For example, Compeau and Higgins (1995)found that individuals with a higher level of technology self-efficacy experienced lower levels of technology anxiety, higher technology usage and a higher level of comfort working with technology. A higher level of technology self-efficacy also results in a more positive attitude towards technology (Venkatesh & Davis, 1996).

There are also studies that looked at the impact of technology self-efficacy on technostress. The results show that if an individual has a higher level of technology self-efficacy it will result in a lower level of techno distress (Shu et al., 2011) . The explanation for this effect can be found in the relation between stress and technology self-efficacy. As discussed previously stress is formed when the environmental demands exceed the abilities of the individual. Individuals with a higher technology self-efficacy perceive that a technology related task can

be accomplished. The effect is that in the perception of the individual it is easier to meet the environmental demands with their capabilities, which results in less technostress.

2.3 Job burn-out and job engagement

In this research there are two job outcomes studied, which are job burnout and job engagement. The reason these are selected is because both are considered relevant outcomes of stress (Maslach & Leiter, 1997). In addition, both outcomes are opposite state of minds, where job engagement is a positive state of mind and job burnout is a negative state of mind. Both concepts will be discussed.

Job burnout is a concept that has been studied for 45 years. It is seen as a multidimensional construct (Shirom & Melamed, 2006). The most used conceptualization of burnout is a tri-dimensional construct which consists of exhaustion, cynism and lack of professional efficacy (W. M. Schaufeli, B; Marek, T., 1993). In this conceptualization burnout is defined as: "a persistent, negative, work-related state of mind in normal individuals that is primarily characterized by exhaustion, which is accompanied by distress, a sense of reduced effectiveness, decreased motivation, and the development of dysfunctional attitudes and behaviors at work" (Schaufeli & Enzmann, 1998 , p. 36).

But there has been criticism on self-efficacy dimension. Empirical research found that professional efficacy can be seen as an independent construct (Lee & Ashforth, 1996) . Furthermore, studies found that burnout is created by a lack self-efficacy (Llorens, García-Renedo, & Salanova, 2005) . In addition, a lack in one's competence is a critical factor in the development of a burnout. Therefore, in this study burnout is viewed as a two-dimensional construct of exhaustion and cynicism.

In studies job engagement is seen as the opposite of burnout (W. B. Schaufeli, Salanova, González-Romá, & Bakker, 2002). Job engagement is a positive state of mind. It is a tri-dimensional construct, which consists of vigor, dedication and absorption. The characterization of vigor can be described as highly energetic and mental resilience during work. Dedication is described as involvement in one's work. Individuals with dedication also experience a sense of significance, inspiration, challenge and pride in their work. Absorption can be described as a state of high concentration where the individual is fully absorbed by one's work.

Because job engagement is seen as the opposite continuum of job burnout studies measured it in one construct. The Maslach Burnout Inventory. On this measurement scale low scores in exhaustion, cynism and lack of professional efficacy would represent job engagement (Maslach & Leiter, 1997). This made it impossible to study the relationship between job engagement and job burnout. Therefore, W. B. Schaufeli et al. (2002) proposed to view job engagement and burn out as two different concepts, which can be measured independently with different measurement scales. In this research the approach of W. B. Schaufeli et al. (2002) is used, so it is possible to study the relationship between both concepts.

3 Conceptual model and research hypotheses

Based on the theoretical framework this research focuses on the influence of technology self-efficacy technostress. Technostress is seen as a two-sided spectrum which could result in positive eustress and negative distress. Furthermore, it studies the relationship of techno distress and techno eustress on the job outcomes burnout and job engagement.

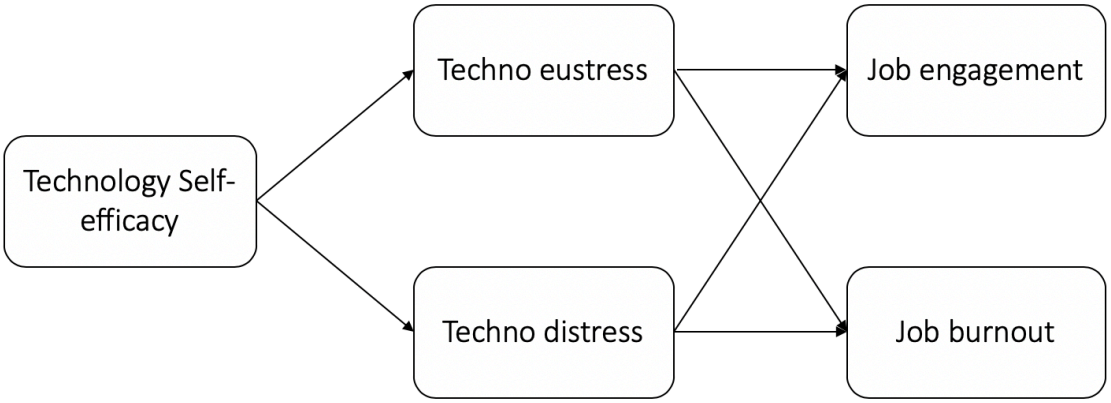

Figure 2 Research model

3.1 Technology self-efficacy

In the literature review the effect of self-efficacy on technostress was discussed. The results showed that a higher level of technology self-efficacy will result in a lower level of technostress (Shu et al., 2011; Tarafdar et al., 2015). The outcomes of this research only focused on techno distress. In this research technostress is seen as a phenomenon which can have both beneficial/ desirable and negative outcomes as shown in figure 1 (transactional model of stress). This means that both techno distress and techno eustress are measured.

In previous (technology) self-efficacy research outcomes have shown that individuals who perceive a lower level of self-efficacy will be more resistant to change than individuals with a higher level of self-efficacy (Ellen, Bearden, & Sharma, 1991). In addition, individuals with a lower level of technology self-efficacy see software usage more as a threat. As a consequence, individuals with a lower level of technology self-efficacy experience more techno distress (Shu et al., 2011; Tarafdar et al., 2015). This leads to hypotheses 1:

1. Technology self-efficacy has a negative influence on techno distress

The usage of software can also be seen as a learning opportunity that helps with individual growth and achievement. In that case individuals learn new skills and increase the performance and productivity (Wajcman & Rose, 2011; Zhang & Espinoza, 1998). In the technostress literature the effect of technology self-efficacy on techno eustress has not been studied. In stress literature there have been studies between of the relationship between self-efficacy and eustress. Result have shown that there is a positive effect of self-efficacy on eustress (Ventura et al., 2015). Therefore, it is expected this relationship will also be present in the study of technology self-efficacy on techno eustress. Therefore, hypotheses 2 is:

2. Technology self-efficacy has a positive influence on techno eustress

3.2 Outcomes of techno distress

There has been a lot of research into the outcomes of techno distress. Results have shown that techno distress has a negative impact on job satisfaction, performance, productivity and commitment (Tarafdar et al., 2015; Tarafdar et al., 2011). Furthermore, techno distress resulted in a higher level of job burnout and a lower level of job engagement (Atanasoff & Venable, 2017). This is similar to studies into stress literature (Ventura et al., 2015). Therefore, it is expected that techno distress has a positive influence on job burnout and a negative influence on job engagement. This results in the following hypotheses:

3a Techno distress has a positive influence on job burnout
3b Techno distress has a negative influence on job engagement

3.3 Outcomes of techno eustress

There have been studies into the outcomes of techno eustress, but studies about techno eustress are limited (Tarafdar et al., 2019). The studies that did research into techno eustress, found that it had helped individuals learn new skills and increased the performance and productivity of these individuals (Wajcman & Rose, 2011; Zhang & Espinoza, 1998). Currently there is no prior study which focused on the effect of techno eustress on job engagement and job burnout. Therefore, more research into techno eustress is necessary (Tarafdar et al., 2019). Research has shown that if stress is appraised as a challenge it leads to beneficial job outcomes. For example, Ventura et al. (2015) found that eustress had a negative influence on job burnout and a positive influence on job engagement. These outcomes support the idea that job engagement is on the opposite continuum of job burnout (W. B. Schaufeli et al., 2002). Therefore, it is expected that if an individual appraises technostress as a challenge it will lower job burnout levels and increase job engagement levels. This results in the following hypotheses:

4a Techno eustress has a negative influence on job burnout
4b Techno eustress has a positive influence on job engagement

As discussed earlier some people perceive stress as a challenge, while others view stress as a threat. Depending on the outcome of the appraisal stress can have beneficial outcomes or negative/ damaging consequences (Lazarus, 1966). Individuals who view the situation as a challenge see it as a learning opportunity, which can lead to growth and achievement. For those individuals stress has a positive influence on performance, productivity and job engagement (Ventura et al., 2015; Wajcman & Rose, 2011). If individuals perceive technostress as a threat the outcomes are the other way around. Technostress leads to lower job satisfaction, performance, productivity organizational commitment and burn-out (Ragu-Nathan et al., 2008; Sarabadani et al., 2018; Tarafdar et al., 2019; Ventura et al., 2015).

4 Method

This section describes the methodology used in this paper. The chapter starts with an explanation of the chosen research method. Next the chapter discusses how and where the data will be collected. The third part of the chapter will discuss the measurement scales used in this research. To conclude details are provided how validity and reliability of the data can be ensured.

4.1 Research method

The first step is selecting an appropriate research method is determining which data need to be collected. The data that needs to be collected should contain the information that is necessary to answer the research hypotheses. Therefore, the data that needs to be collected should represent the subjects in this research (technology self-efficacy, techno distress, techno eustress, job burn-out and job engagement). Furthermore, this data needs to be collected among employees that work with technology.

The hypotheses presented in the conceptual model and research hypotheses focus on two different goals. First the goal is to gain understanding of the effect of technology self-efficacy on techno eustress and techno distress. In addition, the goal is to create understanding of the effects of techno eustress and techno distress on job outcomes. The focus of both goals is to create understanding of a cause and effect relationship between different variables. Therefore, this research can be classified as explanatory research. Furthermore, this research builds upon existing theories by deriving hypotheses based on existing literature. As a consequence, this research can be classified as a deductive research approach.

Two possible research methods that are suitable are experimental design and survey design. The most frequently used research method for explanatory research is survey design (Thornhill, Saunders, & Lewis, 2009). The use of a survey design approach has several benefits. Survey design can collect large quantities of data in a standardized way, which is important when testing for statistical significance. Furthermore, it is a cost-effective method that can be conducted remotely. Data can be collected anonymously and the outcomes of survey design have the capability to represent a large population.

Experimental design is another method that can be utilized. This research method is characterized by a high level of control. It is a method that is easy to replicate. A drawback of experimental design is that it takes place within an artificial environment. This creates a risk that it is not possible to generalize the results of experimental design for a large population. Considering economic, time and travel limitations survey design is the chosen method for data collection.

4.2 Data collection

The survey was created in Limesurvey, which is survey design software. The next step was to select an appropriate sample population. There were a few selection criteria for the questionnaire-based survey. First of all, it is important that participants are employees at a company, because this research is focused on technostress within an organizational context.

Furthermore, it is important that all participants of the survey work with technology, because the concept of technostress is the main focus of this research. In addition, it is beneficial that all participants of the survey work within the same organization. If all participants work within the same organization it will limit differences in the work environment, which could influence the results. Because of time and economical limitations, a convenience sampling method has been chosen. The researcher had access to an organization which met the different selection criteria.

The survey was distributed at a medium sized automation company, which has approximately 300-400 employees. The company has business units in both the Netherlands and the Philippines. The vast majority of the employees work in the Philippines. The company has restricted that data collection should be anonymously.

Participation in the survey will be voluntary. Furthermore, data will be collected anonymously and all data will be handled confidential. This information will also be shared with the respondents. The survey was sent to all employees within the company excluding the management team. The company has a mail list which is used for internal surveys. This list has also been used for this research, because not all employees have a company email address. Before the survey was sent the HR department within the company notified the employees that an email containing a survey would be sent to them and that participation was voluntary.

After the survey was distributed it became clear that the mail list of the company was incomplete. Therefore, a collection of email addresses of employees that did not receive the survey was done. The survey was distributed again to the previously unknown email addresses.

4.3 Measurement scales

The measurement scales in this research used for the operationalization of the constructs are all based on existing measurement scales. The rationale behind using existing measurement scales is that these measurement scales have been validated in previous research. In addition, it is beneficial to use existing measurement scales to compare with other research outcomes into technology self-efficacy, technostress and job outcomes. There has been small modification to the research questions for a better fit with the current research model. The survey questions can be found in Appendix B. For all survey questions a Likert scale will be used.

For computer self-efficacy the measurement scale of Compeau and Higgins (1995) is used. This self-efficacy scale is also used in other research on computer self-efficacy (Shu et al., 2011; Tarafdar et al., 2015). The scale of Compeau and Higgins (1995) focus on the usage of software in general. This measurement scale is suitable, because within the company there is no software package that is used by all employees. It was important to notify the participants that the focus was on the software used within the company. Therefore, the following description was added to the measurement scale: “On this page we would like to know how you are coping with the usage of computer software provided by your employer”. The measurement of techno distress will be done with the measurement scale of Ragu-Nathan et

al. (2008). Other research of self-efficacy and technostress used the same measurement scale (Shu et al., 2011; Tarafdar et al., 2015). This measurement scale measures the five different dimensions of techno distress, which are: 1. Techno-overload, 2. Techno-invasion, 3. techno-complexity, 4. techno-insecurity, 5. techno-uncertainty. For techno-eustress there is not a specific measurement scale. Therefore, the eustress measurement scale of O'Sullivan (2011) was used. With small modifications it was possible to change the topic of the items from eustress to techno eustress. The job burnout scale used is adapted from the Maslach Burnout Inventory scale (W. B. Schaufeli et al., 2002). Only the core burnout dimensions exhaustion and cynicism have been adapted. There is a specific work measurement scale available. The job engagement scale of W. B. Schaufeli et al. (2002) has been adapted. This scale is specifically tailored for work.

There are a few control variable questions in this research. The control variables that are added are related to technostress inhibitors. Technostress inhibitors are variables that mitigate distress and increase eustress. Therefore, it is important to know if there are in group differences between the participants. The technostress inhibitors that are used are based on research of Ragu-Nathan et al. (2008). Literacy facilitation, technical support provision and involvement facilitation are the control variables added. Literacy facilitation is about sharing of IT-knowledge within the company. Technical support are activities that solve IT problems for the employees. Involvement facilitation is informing employees why new technology within the company is being used.

There are also demographic control variables added in this research. The reason is that Tarafdar et al. (2011) found that demographics can influence technostress levels. Included control variables are gender, age, educational level and office location.

4.4 Validity

Another important part of the methodology is to ensure that the measurement scales measure what is intended to measure. Internal validity is used to ensure that the results of cause and effect relationship are not found due to methodological errors. Therefore, during the creation of a questionnaire it is important to establish internal validity. This research takes several precautions to ensure internal validity.

The first precaution for internal validity is the usage of validated measurement scales. These measurement scales have already been checked for internal reliability. Another precaution is that in the data analysis the Cronbach's alpha and the composite reliability of the different measurement constructs will be checked to ensure internal validity. If the internal consistency for a measurement construct is too low the question will be excluded from the measurement scale.

This research also checks for discriminant validity. Discriminant validity measures if a construct is distinct from other constructs that are used in the research. Discriminant validity is partially covered by using existing validated measurement scales. In addition, this research uses Cross-loadings and Heterotrait-monotrait ratio to ensure discriminant validity.

The choice of a convenience sampling method could create some bias in the results. As a consequence, it could be that the results in this research are not fully representative for the target population. To limit the risks of not being representative a few precautions were taken. Because a convenience sampling method has been chosen the target was to collect a large sample size, this decreases the risk for not being representative. Therefore, within the company participation in the survey was encouraged. To maximize the number of participants a reminder was sent to the employees. To account for response bias data gathering was anonymously. Furthermore, questions concerning demographics were added to the survey to test for non-response bias.

4.5 Data analysis

The survey that is distributed will generate quantitative data. Therefore, to analyze the data statistical methods and tools need to be used. To select an appropriate statistical method, it is important to look at the characteristics of a specific research. This research will have a limited sample size. Furthermore, this research contains both formative and reflective constructs. Therefore, a statistical method was necessary that is able to measure differences between the constructs used in this research and the underlying indicators. In addition, the used statistical method should be able to measure the relationship between the different constructs in this research. A multivariate statistical method that is capable in performing both analyses is called partial least squares structural equations modeling (PLS-SEM). Therefore, PLS-SEM will be used to statistically analyze the data.

Results

In this section the analysis and results of the data collection will be presented. The statistical analysis has been performed both in SmartPLS 3.0 and Excel. The chapter starts with the descriptive statistics. After that the variables are checked for reliability and validity. The last step of the results tests the hypotheses.

5.1 Descriptive statistics

A total of 308 people within the company were invited to participate in the survey. Out of the 308 people invited a total of 294 employees started in the survey. Of the 294 respondents a total of 236 (80,3 %) could be used for further analysis. The other respondents did not finish the complete survey. Therefore, these responses were excluded from further statistical analysis.

Table 1 shows the demographics of the study sample. The majority of the respondents is female (66,9%). In addition, most of the respondents are under 35 years old (18-24 years 50, 4% and 25-34 years old 44,9%). Furthermore, on an educational level almost the total population has a bachelor's degree (97,9%). 234 of the 236 respondents where situated in the Philippines office. The response rate for the Dutch office was 2 out of 20 employees (10,0%), while in the Philippines office the response rate was a lot higher with 234 of 288 responding (81,3%).

Table 1. Characteristics of the sample

Characteristics of sample (n = 236)	% of sample
Gender	
Male	33,1 % (78)
Female	66,9 % (158)
Age	
18-24 years	50,4 % (119)
25-34 years	44,9 % (106)
35-44 years	3,4 % (8)
45-54 years	1,3 % (3)
Education	
Bachelor's degree	97,9 % (231)
Master's degree	1,3 % (3)
Other	0,8 % (2)
Country	
Philippines	99,2 % (234)
Netherlands	0,8 % (2)

The first step in the analysis was to check the descriptive statistics of the different dimensions and constructs used in this research. Below is shown table 2 with the descriptive statistics of this research. The results indicate that participants score relatively high on eustress and job engagement in comparison to the scores on techno distress and job burnout. Furthermore, the score on technology self-efficacy is high, which implies that participants are proficient with the IT used within the company. Upon further questioning a lot of the participants (in the Phillipines) mostly use software that can perform one task. This could explain the high scores for technology self-efficacy.

Table 2. Descriptive statistics constructs

	Mean	ST DEV	MIN	MAX
Technology self-efficacy	5,225	1,240	1	7
Techno eustress	3,500	0,760	1	5
Techno overload	4,354	1,384	1	7
Techno invasion	3,552	1,542	1	7
Techno complexity	3,657	1,313	1	7
Techno insecurity	3,081	1,466	1	7
Techno uncertainty	4,811	1,101	1	7
Cynism	2,980	1,458	1	7
Exhaustion	3,910	1,597	1	7
Absorption	4,659	1,141	1	7
Dedication	5,291	1,208	1	7
Vigor	4,879	1,157	1	7

5.2 Correlations

The following step in analyzing the data was to calculate the correlations between the latent constructs. The correlations can be calculated by first calculating the factor scores. Next the correlations between the factor scores can be analyzed. The results are shown in appendix C.

The results of the correlation matrix show a weak correlation between technology self-efficacy and the constructs of eustress and distress. There is a strong correlation between the dimensions of techno distress and the construct technostress itself. A similar positive correlation is found between the dimensions cynism and exhaustion and job burnout. For job engagement there is a strong correlation with the underlying dimensions absorption, dedication and vigor. In addition, it seems there is a moderately positive correlation between technostress and job burnout. A very weak but negative correlation between techno distress and job engagement. For techno eustress there was a moderate negative correlation with job burnout and a weak positive correlation with job engagement. Between job burnout and job engagement there is a moderate negative correlation.

5.3 Reliability & validity

The next step of the analysis was checking the reliability of the data. The reliability of the reflective measurements is checked both for indicator reliability and convergent reliability. The first step of the analysis checks for the internal reliability through Cronbach's alpha and the composite reliability. The results of the factor loadings in SmartPLS showed that the constructs Dedication, Cynism, Techno uncertainty and Techno overload had loadings over 0.9 for both the Cronbach's Alpha and the composite reliability. If loadings are above $x > 0.9$ there is a risk of redundancy. Therefore, the first step of the analysis was to remove indicators with the highest loadings. The following indicators were removed from the analysis; DE 3 for dedication, CY 3 for Cynism, TOV 3 for techno overload and TUN 22 for techno uncertainty.

The removal of the different indicators resulted in a lower Cronbach's Alpha and composite reliability for the reflective measurements. This resulted in a Cronbach's alpha of less than 0.9 except for the construct Dedication (0.906). For several constructs the composite reliability remained higher than 0.9 (but below 0.95). As a consequence, there is a risk of redundancy for these reflective measures (Saunders et al, 2016). At this point no additional indicators were removed, because at least three indicators should be used for reflective measurements.

In the following step of the analysis the outer loadings are inspected for convergent reliability. The analysis showed that there are several outer loadings with a score below 0.40. Therefore, these indicators were removed (CSE 2, TES 4, TES 9, TES 10). There were other indicators that had an outer loading score between 0.40 and 0.70. A check was done if removal of these indicators resulted in a higher Average Variance Extracted (AVE). The results showed an increased in AVE. Consequentially the indicators with loadings between 0.40 and 0.70 were removed from the reflective constructs. The following items were removed; CSE 1, CSE 3 for technology self-efficacy. TIS 16 for techno insecurity. AB 1 for absorption. TES 5, TES 13 and TES 15 for techno eustress. After removal the analysis was run again. Below in table 3 the Cronbach Alpha, Composite Reliability and AVE are shown.

Table 3. Internal consistency and convergent validity of reflective measures

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Absorption	0.780	0.859	0.603
Cynism	0.890	0.931	0.819
Dedication	0.906	0.934	0.781
Exhaustion	0.837	0.892	0.674
Techno Eustress	0.738	0.832	0.554
Techno complexity	0.887	0.917	0.689
Techno insecurity	0.782	0.859	0.604
Techno invasion	0.856	0.903	0.699
Techno overload	0.886	0.921	0.745
Techno uncertainty_	0.889	0.930	0.817
Technology self-efficacy	0.905	0.924	0.635
Vigor	0.859	0.895	0.587

A rule of thumb is that the AVE of reflective measures is above > 0.5. In that case more than 50% of the variance is explained by the individual indicators. As can be seen in Table 3 this is the case.

The following step in the analysis checks for the discriminant validity. The discriminant validity measures if indicators are distinct from each other. If discriminant validity is established it implies that indicators are unique and are not represented by other indicators in the model. In the ideal situation the indicator only measures the intended indicator but in practice that is not always the case. In this thesis two different measures are used to check for discriminant validity. The first measure which is used are the Cross-Loadings.

For the Cross-Loadings it is important that the outer loading of an indicator is greater than any loading on other indicators. The Cross-Loadings table (See appendix D) showed that there are several indicators which have cross-loadings x > 0.4. There should be sufficient difference between the outer-loading of an indicator and the cross-loading with another indicator. Therefore, if there is a difference of less than 0.15 indicators will be removed from the model. There is one indicator which has a difference smaller than 0.15, which is AB6 an indicator of absorption. Therefore, the indicator AB6 is removed from the model. All other indicators have a lower correlation and are used in the model.

The second measure is the Heterotrait-monotrait ratio (HTMT). This ratio measures the difference between-trait correlations with the within-trait correlations. It measures a score between 0 and 1. Previous research states that indicators should be removed if a threshold of 0.9 has been met. In table 4 the results of the HTMT are shown. The table shows that the threshold of 0.9 for the different reflective measures have not been met. This implies that there are no issues with the discriminant validity. Therefore, no indicators need to be removed.

Table 4. Heterotrait-monotrait ratio

	Absorption	Cynism	Dedication	Exhaustion	Techno Eustress	Techno complexity	Techno insecurity	Techno invasion	Techno overload	Techno uncertainty	Technology self-efficacy	Vigor
Absorption												
Cynism	0.269											
Dedication	0.640	0.610										
Exhaustion	0.150	0.612	0.267									
Techno Eustress	0.212	0.294	0.235	0.336								
Techno Complexity	0.165	0.428	0.171	0.547	0.295							
Techno Insecurity	0.108	0.604	0.188	0.483	0.278	0.623						
Techno Invasion	0.155	0.465	0.192	0.538	0.183	0.479	0.621					
Techno Overload	0.172	0.148	0.156	0.308	0.091	0.372	0.374	0.442				
Techno Uncertainty	0.338	0.118	0.204	0.181	0.129	0.285	0.206	0.143	0.474			
Technology Self-efficacy	0.305	0.080	0.307	0.126	0.168	0.065	0.121	0.063	0.143	0.246		
Vigor	0.667	0.385	0.710	0.331	0.341	0.138	0.209	0.121	0.146	0.295	0.241	

The next step in the research is to assess the formative measures. There are different analyses to assess the formative measures. The first step was to assess the significance of the outer weights. The outer weights should be significant. In appendix E the analysis of the outer weights is shown. All T-values are at least 6.144. This means that all outer weights have a significance greater then 1 percent, because the cutoff T-value is greater than 2.57.

For formative measures it is also important to check for collinearity issues. This can be checked by calculating the Variance Inflation Factors (VIF score). There are possible issues if a VIF score is greater than 5. Table 5 shows the VIF loadings for the formative measures. The

results show that all formative measures stay below the threshold of 5.0. This implies that there are no multi collinearity issues.

Table 5. Variance Inflation Factors

	Job Burnout	Job engagement	Techno Eustress	Technostress
Absorption		1.615		
Age	1.117	1.112		
Control variable 1	1.222	1.230		
Control variable 2	1.090	1.079		
Control variable 3	1.213	1.201		
Cynism	1.599			
Dedication		1.858		
Exhaustion	1.694			
Gender	1.046	1.058		
Job Burnout				
Job engagement				
Techno Eustress	1.124	1.157		
Techno complexity				1.521
Techno insecurity				1.625
Techno invasion				1.531
Techno overload				1.446
Techno uncertainty_				1.307
Technology self-efficacy			1.000	1.063
Technostress	1.524	1.125		
Vigor		1.954		

5.4 Hypotheses

The assessment of both the formative and reflective measurements has shown that the measurements are reliable and valid. The next step is to assess the hypotheses and with that the structural model. This part of the research focuses on the significance and relevance of the relationships, the coefficient of determination and the effect sizes.

The first step is to look at the significance and relevance of the relationships in the model. Table 6 shows the P values for the different hypotheses in the model. The results show that technology self-efficacy doesn't have a significant effect on techno distress. There is a significant relationship for technology self-efficacy on techno eustress, although it should be noted that this is at the 5% significance level instead of the 1% significance level (T-value = 2.015 & P = 0.044). Therefore, H1 is not confirmed and H2 is accepted.

The effect of technostress on job burnout is significant with a T-value of 10.064 (P = 0.000). This means that H3A is confirmed. The relationship of technostress on job engagement is not significant (P = 0.676). Therefore, H3B has not been confirmed.

The relationship of techno eustress on job burnout is significant (T-value = 3.840 & P = 0.000). This means that hypotheses H4A has been confirmed. For techno eustress and job engagement the relationship is also significant (T-value = 4.012 & P = 0.000). This means that H4B has also been confirmed.

Table 6. Significance and relevance of hypotheses

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
H1: Technology self-efficacy -> Techno distress	0.055	0.055	0.064	0.869	0.385
H2: Technology self-efficacy -> Techno eustress	0.138	0.139	0.069	2.015	0.044
H3A: Technostress -> Job burnout	0.503	0.503	0.050	10.064	0.000
H3B: Technostress -> Job engagement	0.027	0.029	0.064	0.418	0.676
H4A: Techno eustress -> Job burnout	-0.195	-0.194	0.051	3.840	0.000
H4B: Techno eustress -> Job engagement	0.269	0.269	0.067	4.012	0.000

The next step is looking at the coefficient of determination. The coefficient of determination shows how much variance of the endogenous latent variable can be explained by all the exogenous latent variables combined. In this research several endogenous variables are explained by exogenous variables. Significance and relevance testing of the hypotheses showed that technology self-efficacy doesn't have a significant effect on techno eustress and techno distress. This result is also shown in table 7, where the adjusted R^2 of technostress is -0.001 and for techno eustress the adjusted $R^2 = 0.015$. For job engagement an adjusted $R^2 = 0.101$ is found. The endogenous latent variable job burnout has an adjusted $R^2 = 0.370$. The rule of thumb in scholar research states that an $R^2 = 0.50$ can be seen as a moderate effect, while an $R^2 = 0.25$ can be seen as a weak effect (Hair et al., 2011; Henseler et al., 2009). This means that for job burnout a weak to moderate effect has been found, while the effect found for job engagement can be seen as very weak.

Table 7. Coefficient of determination

	R Square	R Square Adjusted
Job burnout	0.389	0.370
Job engagement	0.128	0.101
Techno eustress	0.019	0.015
Technostress	0.003	-0.001

The following step is looking at the impact of specified exogenous variables on the endogenous variable. This is measured by the f^2 effect sizes. Table 8 shows the effect sizes. For the f^2 effect sizes the rule of thumb is $f^2 = 0.35$ is a large effect, $f^2 = 0.15$ is a medium effect and $f^2 = 0.02$ is a small effect. For job engagement the only factor with a small to medium effect is techno eustress with $f^2 = 0.078$. The effect of techno eustress on job burnout is also small with $f^2 = 0.058$. Another small effect is age on job burnout with $f^2 = 0.02$, but this is a small effect. The endogenous technostress has a large effect on job burnout with an $f^2 = 0.373$. The other variables didn't have significant and relevant impact on techno eustress and techno distress.

Because age had a weak effect on job burnout an additional analysis was done if there were group differences. Two groups were created and compared to each other to check if there were differences between groups. Group 1 consisted only of people aged 18-24 years old. The rest of participants were grouped in group 2. The additional analysis did not result in any significant differences.

Table 8. effect sizes

	Job burnout	Job engagement	Techno eustress	Technostress
Age	0.020	0.018		
Control variable 1	0.005	0.011		
Control variable 2	0.005	0.004		
Control variable 3	0.001	0.012		
Gender	0.012	0.007		
Techno eustress	0.058	0.078		
Technology self-efficacy			0.020	0.003
Technostress	0.373	0.001		

6. Discussion, conclusion and recommendations

This section reflects upon the execution and limitations off this study. It starts with a discussion. Furthermore, it draws a conclusion based on the results. The last part of the chapter provides recommendations for practice and future research.

6.1 Discussion

This research has been divided in two steps. The first step was to find if technology self-efficacy has an influence both on techno distress and techno eustress. The second step was to evaluate both the influence of techno distress and techno eustress on job-burnout and job engagement.

The empirical results have demonstrated that technology self-efficacy does not have a significant effect on techno distress. Therefore, hypotheses H1 was rejected. This result opposes the findings of Shu et al. (2011), which found a significant effect of technology self-efficacy on techno distress. First of all, a comparison on the outcomes of the dimensions of technology self-efficacy and techno distress is done between the outcomes of Shu et al. (2011) and the outcomes of this research. The results are shown in table 9. The results show that the scores on technology self-efficacy between the current research and Shu et al. (2011) are comparable. The outcomes of both research indicate that participants have a high level of technology self-efficacy. There are differences on the dimensions of techno distress. The mean of all dimensions of technostress of the current research are higher than the findings in Shu et al. (2011). This implicates that the participants of this research had a higher level of techno distress.

Table 9. Comparison current research vs Shu et al. (2011)

	Results thesis		Shu et al. (2011)	
	Mean	STD	Mean	STD
Technology self-efficacy	5,225	1,24	5,23	1,295
Techno overload	4,354	1,384	3,07	0,813
Techno invasion	3,552	1,542	3,42	0,684
Techno complexity	3,657	1,313	2,08	0,751
Techno insecurity	3,081	1,466	3,01	0,751
Techno uncertainty	4,811	1,101	3,36	0,798

A possible explanation for the differences between the outcomes of Shu et al. (2011) and the current research is that research into the effect of technology self-efficacy on techno distress and techno eustress is limited. Therefore, the link between the variables has not been extensively established, which could lead to different outcomes between studies.

Second, the research of Shu et al. (2011) focused on employees who work with computer technology routinely. The employees worked in different industries and organizations. Therefore, it is difficult to compare which software these participants used and if software usage of these participants differed. This means that there could be different outcomes based

on the software packages the respondents use. Based on the assumption from Compeau & Higgins (1995) stress is formed when the environmental demands exceed the abilities of the individual, the type of software and the difficulty of the software used could increase the gap between the environmental demands and someones ability, which could increase techno stress levels.

However, hypotheses H2 was accepted at a 95% confidence interval. This seems to indicate that if users have a higher level of technology self-efficacy it should lead to higher eustress levels. These finding are expected, because in the literature there has been a positive effect of self-efficacy on eustress (Ventura et al., 2015). This implicates that if companies increase technology self-efficacy it is beneficial for eustress levels.

The next step was to look at the relationship of techno distress on job-burnout and job engagement. For techno distress on job-burnout a significant relationship could be established, therefore hypotheses H3a is accepted. This means that a higher level of techno distress lead to higher job burnout levels. The effect size has shown that techno stress has a large effect. This confirms previous findings that technostress increases job burnout levels (Atanasoff & Venable, 2017).

Techno distress did not have a significant impact on job engagement, as a consequence hypotheses 3B was not accepted. The findings in this research contrasts previous findings where higher levels of techno distress leads to a lower level of job engagement (Atanasoff & Venable, 2017). A possible explanation could be that the employees gave desirable answers on the job engagement questions. Table 2 of the results show the descriptive statistics of the different dimensions. The averages for the dimensions of job engagement could indicate desirable answers have been given (Absorption Mean: 4,659 STD: 1,141 Dedication Mean: 5,291 STD: 1,208 Vigor Mean: 4,879 STD 1,157) This could be appropriated to cultural differences. For example the Philippines have an hierarchical organizational structure. Furthermore, in Philippinian culture conflicts are avoided.

For techno eustress a significant relationship is found for both job burnout and job engagement. Therefore, hypotheses 4A and 4B are accepted. It should be noted that the found effect sizes are between weak and medium. As discussed, in the conceptual model there has been no known prior research into the effect of techno eustress on job-burnout and job engagement. Furthermore, research into techno eustress as a whole is limited (Tarafdar et al., 2019). As a consequence, a general eustress management measurement scale of O'Sullivan (2011) was adapted for usage. Adapting an existing eustress measurement scale to a techno eustress measurement scale could influence the outcomes.

The results show that techno eustress positively lowers job burn-out levels and increases job engagement among employees. Although further research is necessary the results indicate that it is beneficial for organizations to create a work environment with limited amounts of stress, where employees experience techno eustress instead of techno distress.

It should be noted that this research has an important limitation concerning the demographics of the population. The participants are homogenous concerning age, education and descent. This is an issue that sometimes arises when using a convenience sampling

method. Although this research tried to mitigate this risk by gathering a large sample population the issue nevertheless occurred. This research did not consider that the hiring process within the Philippian offices specifically targeted young individuals with a certain educational level. Therefore, it could be that the results found in this research are not applicable for the general population.

6.2 Conclusion

The goal of this research was twofold. First it was important to look if technology self-efficacy impacts the level of techno eustress or techno distress somebody perceives. Furthermore, the research looked if the job outcomes burn-out and job engagement were influenced by techno distress or techno eustress. This led to the following question:

Does technology self-efficacy influence both techno distress and techno eustress? And do techno distress and techno eustress influence burn-out and job engagement among employees?

The main findings show that technology self-efficacy does not have a positive or negative impact on techno distress. This implicates that the level of techno distress is not influenced by the level of technology self-efficacy. There is a positive significant influence of technology self-efficacy on techno eustress. This implies that a higher level of technology self-efficacy could lead to higher levels of techno eustress.

Furthermore, the research showed that techno distress has a significant impact on job burnout. This implicates that higher level of techno distress lead to higher job burnout levels. Techno eustress had a small but positive impact on job burnout levels and increased job engagement. As a consequence, it is important to create a work environment where mainly techno eustress is stimulated, while minimizing techno distress levels.

6.3 Recommendations for practice

This research has practical implications for employers. First of all, if a company wants to minimize the risk of job burnout among employees it is important to keep techno distress levels as low as possible. Therefore, if companies want to decrease the number of burn-outs among employees it is important to minimize the level of techno distress.

In addition, if employers want to have motivated employees and a decreased risk of employee turnover it should strive for an environment where employees are mostly exposed to techno eustress. Techno eustress leads to higher levels of job engagement and decreases the risks of job burn-out.

6.4 Recommendations for further research

Based on this research several recommendations for further research could be derived. First of all, this research has several limitations. As discussed earlier, an important limitation is the homogeneity of the sample population. The group mainly consisted of participants with a similar descent, age group and educational level. Therefore, it could be that the results found

in this research are not applicable to the general population. In addition, it was not possible to study multi group differences. Therefore, further research could try to replicate this research with a more differentiated sample population to check if the outcomes found can be replicated. Furthermore, with a differentiated sample population it is possible to check for in group differences.

Another limitation of this research was the use of an adjusted eustress management scale. The reason is that in concurrent research no specific techno eustress scale has been developed. Considering the limited amount of time, it was not possible to create a specific techno eustress scale for this research. Therefore, further research could focus on the development of a techno eustress scale. This could increase insights in techno eustress, because at this moment it is for example not known if the concept of techno eustress consists of several underlaying dimensions.

As stated in the research hypotheses, the outcomes of techno eustress are an understudied subject in the literature. To our knowledge no prior research studied the impact of techno eustress on job burnout and job engagement. The results have shown that there is a significant, but small effect on both concepts. Therefore, it is recommended that future research tries to expand understanding into the positive effects of techno eustress on job burnout and job engagement.

Literature

Atanasoff, L., & Venable, M. A. (2017). Technostress: Implications for adults in the workforce. *The career development quarterly, 65*(4), 326-338.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist, 37*(2), 122.

Bandura, A. (1986). Social cognitive theory of moral thought and action. In *Handbook of moral behavior and development* (pp. 69-128): Psychology Press.

Barber, L. K., & Santuzzi, A. M. (2015). Please respond ASAP: Workplace telepressure and employee recovery. *Journal of Occupational Health Psychology, 20*(2), 172.

Betz, N. E., & Hackett, G. (1981). The relationship of career-related self-efficacy expectations to perceived career options in college women and men. *Journal of counseling psychology, 28*(5), 399.

Brod, C. (1984). *Technostress: The human cost of the computer revolution*: Addison Wesley Publishing Company.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly*, 189-211.

Ellen, P. S., Bearden, W. O., & Sharma, S. (1991). Resistance to technological innovations: an examination of the role of self-efficacy and performance satisfaction. *Journal of the academy of marketing science, 19*(4), 297-307.

EU. (2014). *The impact of ICT on job quality: evidence from 12 job profiles*. Retrieved from

Folkman, S., & Lazarus, R. S. (1984). *Stress, appraisal, and coping*: New York: Springer Publishing Company.

Folkman, S., Schaefer, C., & Lazarus, R. S. (1979). Cognitive processes as mediators of stress and coping. *Human stress and cognition*, 265-298.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19, 139–151.

Jones, J. W. (1989). Personality and epistemology: Cognitive social learning theory as a philosophy of science. *Zygon®, 24*(1), 23-38.

Jorgenson, D. W., Stiroh, K. J., Gordon, R. J., & Sichel, D. E. (2000). Raising the speed limit: US economic growth in the information age. *Brookings papers on economic activity, 2000*(1), 125-235.

Jorgenson, D. W., & Vu, K. (2005). Information technology and the world economy. *Scandinavian Journal of Economics, 107*(4), 631-650.

Lazarus, R. S. (1966). Psychological stress and the coping process.

Lee, R. T., & Ashforth, B. E. (1996). A meta-analytic examination of the correlates of the three dimensions of job burnout. *Journal of applied Psychology, 81*(2), 123.

Levy, Y., & Ellis, T. J. (2006). A systems approach to conduct an effective literature review in support of information systems research. *Informing Science, 9*.

Llorens, S., García-Renedo, M., & Salanova, M. (2005). Burnout como consecuencia de una crisis de eficacia: un estudio longitudinal en profesores de secundaria. *Revista de Psicología del Trabajo y de las Organizaciones, 21*(1-2), 55-70.

Maslach, C., & Leiter, M. P. (1997). *The truth about burnout: How organizations cause personal stress and what to do about it*. New York: Jossey-Bass.

McGrath, J. (1976). Stress and behavior in organizations. In *Handbook of industrial and organizational psycholog*. Chicago: Rand McNally.

O'Sullivan, G. (2011). The relationship between hope, eustress, self-efficacy, and life satisfaction among undergraduates. *Social indicators research, 101*(1), 155-172.
Ragu-Nathan, T., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q. (2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information systems research, 19*(4), 417-433.
Sarabadani, J., Carter, M., & Compeau, D. (2018). 10 Years of Research on Technostress Creators and Inhibitors: Synthesis and Critique.
Schaufeli, W., & Enzmann, D. (1998). *The burnout companion to study and practice: A critical analysis*: CRC press.
Schaufeli, W. B., Salanova, M., González-Romá, V., & Bakker, A. B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness studies, 3*(1), 71-92.
Schaufeli, W. M., B; Marek, T. (1993). The future of burnout. In C. M. W.B. Schaufeli, & T. Marek (Ed.), *Professional Burnout: Recent developments in theory and research* (pp. 253-259). New York: Taylor & Francis.
Shirom, A., & Melamed, S. (2006). A comparison of the construct validity of two burnout measures in two groups of professionals. *International journal of stress management, 13*(2), 176.
Shu, Q., Tu, Q., & Wang, K. (2011). The impact of computer self-efficacy and technology dependence on computer-related technostress: A social cognitive theory perspective. *International Journal of Human-Computer Interaction, 27*(10), 923-939.
Tarafdar, M., Cooper, C. L., & Stich, J. F. (2019). The technostress trifecta-techno eustress, techno distress and design: Theoretical directions and an agenda for research. *Information Systems Journal, 29*(1), 6-42.
Tarafdar, M., Pullins, E. B., & Ragu-Nathan, T. (2015). Technostress: negative effect on performance and possible mitigations. *Information Systems Journal, 25*(2), 103-132.
Tarafdar, M., Tu, Q., Ragu-Nathan, T., & Ragu-Nathan, B. S. (2011). Crossing to the dark side: examining creators, outcomes, and inhibitors of technostress. *Communications of the ACM, 54*(9), 113-120.
Thornhill, A., Saunders, M., & Lewis, P. (2009). *Research methods for business students*: Prentice Hall: London.
Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision sciences, 27*(3), 451-481.
Ventura, M., Salanova, M., & Llorens, S. (2015). Professional self-efficacy as a predictor of burnout and engagement: The role of challenge and hindrance demands. *The Journal of Psychology, 149*(3), 277-302.
Wajcman, J., & Rose, E. (2011). Constant connectivity: Rethinking interruptions at work. *Organization studies, 32*(7), 941-961.
Wennekers, A. B., Jeroen; van Campen, Cretien. (2018). *De sociale staat van Nederland 2018*. Retrieved from
Zhang, Y., & Espinoza, S. (1998). Relationships among computer self-efficacy, attitudes toward computers, and desirability of learning computing skills. *Journal of research on Computing in Education, 30*(4), 420-436.
Zuboff, S. (2015). Big other: surveillance capitalism and the prospects of an information civilization. *Journal of Information Technology, 30*(1), 75-89.

Appendix A Key string research

Below are the results of the key string search in Summon. To increase quality assurance on the articles found a filter was added that only shows peer reviewed articles In Summon it is possible to filter search results on peer reviewed articles. Furthermore, only articles of the first page were scanned. All potential interesting articles were downloaded and read. Below is shown a matrix of the findings from the Summon library.

Searchterm(s)	Filters	Number of hits	Relevant articles
Technostress	Peer reviewed	664	3
Techno eustress	Peer reviewed	16	1
Techno distress	Peer reviewed	1463	2
Technostress outcomes	Peer reviewed	376	4
Technostress AND self-efficacy	Peer reviewed	145	5
Technostress AND technology self-efficacy	Peer reviewed	143	5
Techno eustress AND technology self-efficacy	Peer reviewed	6	1
Techno distress AND technology self-efficacy	Peer reviewed	51	3
Technostress AND job burnout	Peer reviewed	116	4
Techno eustress AND job burnout	Peer reviewed	4	1
Techno distress AND job burnout	Peer reviewed	60	3
Technostress AND job engagement	Peer reviewed	115	3
Technostress creators	Peer reviewed	96	5
Technology self-efficacy	Peer reviewed	62292	1
Technology self-efficacy AND stress	Peer reviewed	22678	2
Technology self-efficacy AND burnout	Peer reviewed	3020	1
Technology self-efficacy AND job burnout	Peer reviewed	2395	1
Technology self-efficacy AND job engagement	Peer reviewed	8797	1

The search results in Summon had a lot of overlap. Based on the keyword search the following articles were selected on relevance.

Article	Year	Writers
Technostress: implications for adults in the workforce	2017	Atanasoff & Venable
The consequences of technostress for end users in orgaizatior	2008	Ragu-Nathan et al.
From burnout to engagement: Is it a new perspective?	2000	Salanova et al.
The impact of computer self-efficacy and technology	2011	Shu et al.
The technostress trifecta- techno eustress techno dist....	2019	Tarafdar et al.
Technostress: negative effect on performance and	2015	Tarafdar et al.
Crossing to the dark side: examaning creators, outc....	2011	Tarafdar et al.
Professional self-efficacy as a predictor of burnout	1996	Venkatesh & Davis

Appendix B Measurement scales

For the demographics and control variables the following questions are asked:

Demographics

1. What is your gender?
    - Male
    - Female

2. What is your age?
    - Free format

3. What is your educational level?
    - Primary school
    - High school
    - Associate degree
    - Bachelor degree
    - Master degree
    - Doctor

4. Where is your office situated?
    - Netherlands
    - Philippines

Control variables

Literacy facilitation
Within the company it is encouraged to share knowledge about the functionalities of software package? Yes/ no

Technical support
If I have an issue related to software package I can ask the helpdesk to solve this problem for me? Yes/ no

Involvement facilitation
It is clear to me why the company started to use software package? Yes/ no

Technology self-efficacy by Compeau & Higgins (1995)

CSE_1—I could complete the job using software package if there was no one around to tell me what to do as I go
CSE_2— I could complete the job using software package if I had never used a package like it before
CSE_3 — I could complete the job using software package if I had only the software manuals for reference
CSE_4 — I could complete the job using software package if I had seen someone else using it before trying it myself

CSE_5 — I could complete the job using software package if I could call someone if I got stuck
CSE_6 — I could complete the job using software package if someone else had helped me get started
CSE_7 — I could complete the job using software package if I had a lot of time to complete the job for which the software was provided
CSE_8 — I could complete the job using software package if I had just the built-in help facility for assistance
CSE_9 — I could complete the job using software package if someone showed me how to do it first
CSE_10 — I could complete the job using software package if I had used similar packages before this one to do the same job

Techno distress by Ragu-Nathan et al. (2008)

Techno-overload (Reliability=0_82) 3_00 0_91
TOV_1—I am forced by this technology to work much faster.∗
TOV_2—I am forced by this technology to do more work than I can handle.
TOV_3—I am forced by this technology to work with very tight time schedules.
TOV_4—I am forced to change my work habits to adapt to new technologies.
TOV_5—I have a higher workload because of increased technology complexity.

Techno-invasion (Reliability=0_80) 2_21 0_83
TIN_6—I spend less time with my family due to this technology.∗
TIN_7—I have to be in touch with my work even during my vacation due to this technology.
TIN_8—I have to sacrifice my vacation and weekend time to keep current on new technologies.
TIN_9—I feel my personal life is being invaded by this technology.

Techno-complexity (Reliability=0_77) 2_71 0_75
TCO_10—I do not know enough about this technology to handle my job satisfactorily.
TCO_11—I need a long time to understand and use new technologies.
TCO_12—I do not find enough time to study and upgrade my technology skills.
TCO_13—I find new recruits to this organization know more about computer technology than I do.
TCO_14—I often find it too complex for me to understand and use new technologies.

Techno-insecurity (Reliability=0_78) 2_53 0_80
TIS_15—I feel constant threat to my job security due to new technologies.
TIS_16—I have to constantly update my skills to avoid being replaced.
TIS_17—I am threatened by coworkers with newer technology skills.
TIS_18—I do not share my knowledge with my coworkers for fear of being replaced.∗
TIS_19—I feel there is less sharing of knowledge among coworkers for fear of being replaced.

Techno-uncertainty (Reliability=0_83) 3_33 0_76
TUN_20—There are always new developments in the technologies we use in our organization.
TUN_21—There are constant changes in computer software in our organization.
TUN_22—There are constant changes in computer hardware in our organization.
TUN_23—There are frequent upgrades in computer networks in our organization.

Techno eustress by O'Sullivan (2011)

TES_1 How often do you effectively cope with stressful changes that occur in your work life?
TES_2 How often do you deal successfully with irritating work hassles?
TES_3 Do you use technology for pleasure? (FILLER QUESTION)
TES_4 How often do you feel that stress positively contributes to your ability to handle your work problems?
TES_5 In general, how often do you feel motivated by your stress?
TES_6 Do you go out with friends during the week? (FILLER QUESTION)
TES_7 In general, how often are you able to successfully control the irritations in your work life?
TES_8 In general, how often do you speak with your family? (FILLER QUESTION)
TES_9 In general, how often do you fail at an work task when under pressure?
TES_10 In general, how often are you unable to control the way you spend your time on work?
TES_11 How often do you feel comfortable in your surroundings? (FILLER QUESTION)
TES_12 When faced with work stress, how often do you find that the pressure makes you more productive?
TES_13 How often do you feel that you perform better on an assignment when under work pressure?
TES_14 How often do you practice meditation? (FILLER QUESTION)
TES_15 How often do you feel that stress for an deadline has a positive effect on the results of your work?

Job burnout with the adjusted MBI-GS by Schaufeli et al. (2002). Core dimensions exhaustion and cynicism of burnout

Exhaustion
EX_1 I find it hard to relax after a day's work
EX_2 I feel drained when I finish work
EX_3 When I finish work I feel so tired I can't do anything else
EX_4 It's getting increasingly difficult for me to get up for work in the morning

Cynicism
CY_1 I have become less interested and enthusiastic about my job
CY_2 I feel increasingly less involved in the work I do
CY_3 I can't really see the value and importance of my work
CY_4 I doubt the significance of my work

Job engagement by Schaufeli et al. (2002)

Vigor
VI_1 When I get up in the morning, I feel like going to work
VI_2 At my work, I feel bursting with energy
VI_3 At my work I always persevere, even when things do not go well
VI_4 I can continue working for very long periods at a time
VI_5 At my job, I am very resilient, mentally
VI_6 At my job I feel strong and vigorous

Dedication
DE_1 To me, my job is challenging
DE_2 My job inspires me
DE_3 I am enthusiastic about my job
DE_4 I am proud on the work that I do
DE_5 I find the work that I do full of meaning and purpose

Absorption
AB_1 When I am working, I forget everything else around me
AB_2 Time flies when I am working
AB_3 I get carried away when I am working
AB_4 It is difficult to detach myself from my job
AB_5 I am immersed in my work
AB_6 I feel happy when I am working intensely

Appendix C Correlations

	AB	Age	CV 1	CV 2	CV 3	CY	DE	EX	Gender	Job Burnout	Job engagement	Eustress	TCO	TIS	TIN	TOV	TUN	CSE	Distress	VI
Absorption	1.000																			
Age	0.075	1.000																		
Control variable 1 (CV 1)	-0.085	-0.075	1.000																	
Control variable 2 (CV 2)	0.010	-0.096	0.214	1.000																
Control variable 3 (CV 3)	-0.131	0.057	0.363	0.079	1.000															
Cynism	-0.214	-0.235	0.068	-0.046	0.061	1.000														
Dedication	0.540	0.145	-0.112	0.011	-0.098	-0.547	1.000													
Exhaustion	-0.108	-0.211	0.005	0.041	-0.101	0.530	-0.230	1.000												
Gender	0.132	-0.039	-0.042	-0.101	-0.105	-0.119	0.101	-0.107	1.000											
Job Burnout	-0.181	-0.255	0.039	0.002	-0.030	0.857	-0.432	0.891	-0.128	1.000										
Job engagement	0.773	0.155	-0.130	-0.009	-0.135	-0.446	0.865	-0.259	0.097	-0.396	1.000									
Techno Eustress	0.171	0.136	0.064	-0.072	0.054	-0.253	0.206	-0.277	0.050	-0.305	0.268	1.000								
Techno complexity	-0.048	-0.172	-0.076	0.039	-0.073	0.382	-0.153	0.469	-0.073	0.491	-0.125	-0.238	1.000							
Techno insecurity	-0.022	-0.231	-0.007	0.062	-0.011	0.502	-0.156	0.394	-0.097	0.509	-0.150	-0.223	0.527	1.000						
Techno invasion	-0.094	-0.169	0.059	-0.082	-0.065	0.414	-0.171	0.465	-0.118	0.505	-0.145	-0.146	0.426	0.514	1.000					
Techno overload	0.138	-0.149	-0.014	0.069	-0.121	0.133	0.139	0.265	0.023	0.233	0.157	-0.054	0.334	0.313	0.389	1.000				
Techno uncertainty	0.275	-0.068	-0.090	-0.010	-0.211	0.073	0.173	0.168	0.050	0.142	0.270	0.088	0.264	0.186	0.131	0.425	1.000			
Technology self-efficacy	0.256	-0.020	-0.096	-0.067	-0.006	-0.069	0.272	0.050	-0.021	-0.008	0.283	0.138	-0.002	-0.031	-0.020	0.122	0.221	1.000		
Technostress	0.030	-0.233	-0.032	0.024	-0.119	0.459	-0.087	0.531	-0.076	0.570	-0.045	-0.197	0.794	0.748	0.737	0.681	0.474	0.055	1.000	
Vigor	0.549	0.156	-0.125	-0.034	-0.120	-0.337	0.630	-0.282	0.036	-0.351	0.889	0.282	-0.101	-0.168	-0.099	0.127	0.253	0.204	-0.038	1000

Appendix D Cross-Loadings

Table X. Cross-Loadings

	Absorption	Cynism	Dedication	Exhaustion	Techno Eustress	Techno complexity	Techno insecurity	Techno invasion	Techno overload	Techno uncertainty_	Technology self-efficacy	Vigor
AB[AB2]	0.741		0.427									0.406
AB[AB3]	0.807		0.422									
AB[AB4]	0.753											
AB[AB5]	0.802		0.460									0.501
CSE[CSE10]											0.801	
CSE[CSE4]											0.710	
CSE[CSE5]											0.779	
CSE[CSE6]											0.856	
CSE[CSE7]											0.794	
CSE[CSE8]											0.811	
CSE[CSE9]											0.821	
CY[CY1]		0.898		0.504			0.428	0.400				
CY[CY2]		0.916		0.504		0.424	0.485	0.411				
CY[CY4]		0.901		0.427			0.449					
DE[DE1]	0.472		0.854									0.535
DE[DE2]	0.478		0.896									0.607
DE[DE4]	0.491		0.883									0.530
DE[DE5]	0.468		0.901									0.550
EX[EX1]		0.420		0.771		0.432		0.412				
EX[EX2]				0.814								
EX[EX3]		0.473		0.900				0.435				
EX[EX4]		0.456		0.792								
TCO[TCO10]				0.454		0.831	0.442	0.411				
TCO[TCO11]						0.821						
TCO[TCO12]				0.416		0.820	0.450					
TCO[TCO13]						0.800	0.477					
TCO[TCO14]						0.878	0.434					
TES[TES12]					0.697							
TES[TES1]					0.690							
TES[TES2]					0.762							
TES[TES7]					0.820							
TIN[TIN6]							0.463	0.816				
TIN[TIN7]								0.771				
TIN[TIN8]				0.422			0.425	0.897				
TIN[TIN9]				0.462		0.406	0.467	0.856				
TIS[TIS15]						0.524	0.765	0.420				
TIS[TIS17]							0.782					
TIS[TIS18]		0.437					0.770	0.448				
TIS[TIS19]		0.408					0.791					
TOV[TOV1]									0.877			
TOV[TOV2]									0.899			
TOV[TOV4]									0.856			
TOV[TOV5]									0.820	0.403		
TUN[TUN20]										0.845		
TUN[TUN21]									0.417	0.941		
TUN[TUN23]										0.923		
VI[VI1]	0.472		0.442									0.731
VI[VI2]	0.427		0.487									0.799
VI[VI3]			0.494									0.704
VI[VI4]	0.409		0.415									0.764
VI[VI5]			0.445									0.815
VI[VI6]	0.445		0.596									0.778

Appendix E Significance outerweights

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Cynism -> Job Burnout	0.536	0.536	0.021	24.931	0.000
Exhaustion -> Job Burnout	0.605	0.604	0.018	32.984	0.000
Absorption -> Job engagement	0.294	0.294	0.015	19.041	0.000
Dedication -> Job engagement	0.411	0.410	0.017	23.559	0.000
Vigor -> Job engagement	0.469	0.468	0.017	27.435	0.000
Techno complexity -> Technostress	0.385	0.384	0.026	14.630	0.000
Techno insecurity -> Technostress	0.271	0.271	0.020	13.861	0.000
Techno invasion -> Technostress	0.303	0.303	0.024	12.848	0.000
Techno overload -> Technostress	0.281	0.279	0.022	12.612	0.000
Techno uncertainty_ -> Technostress	0.163	0.159	0.026	6.144	0.000